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GROWING WHITE BEANS IN ONTARIO

(Revision of Factsheet "Growing White Beans in Ontario", February 1981)

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Many types of field beans have been produced as commercial field crops in Ontario since about 1856. The most common is the white bean, often called Navy or Pea bean. White bean production is concentrated in southwestern Ontario, mainly in the counties of Huron, Perth and Middlesex. White beans are grown in adjacent counties and as far east as the Ottawa Valley.

Michigan and the Minnesota-North Dakota area (Mindak) are our major competitors in the marketplace. Michigan growers historically produce in total approximately 2½ to 3½ times the amount of white beans that Ontario growers produce. Mindak production equals that of Ontario.

PRODUCTION PRACTICES

Beans are planted in late May or early June. Hilling takes place about a month after planting. Beans are pulled and windrowed 3 to 3½ months after planting. Combining normally occurs 12 to 48 hours after pulling. Many newer white bean growers have chosen a narrow-row, direct-harvest system over this traditional row crop production. For more information on this system, refer to OMAF Factsheet *Narrow Row, Direct Harvest White Bean Production* (available in Summer 1988).

White beans grow best in a warm, humid climate where rainfall is adequate, but not excessive, and where a killing frost does not occur before early September. For this reason, southwestern Ontario is particularly well suited for white bean production.

Both growth and development of white beans are particularly sensitive to prevailing climatic conditions during the growing season. The stage of development at which such conditions occur is of major importance. While temperature appears to be the most critical factor involved, humidity and rainfall are also important, especially during the bloom and pod-set periods. Excessive rainfall and humidity encourage the spread of bacterial and fungal diseases which attack the foliage and cause reduction in yield and seed quality. A period of cool, damp weather following pod-set may encourage second growth.

OZONE DAMAGE (BRONZING)

White beans are most sensitive than most crops to air pollutants such as ozone. Exhaust from internal combustion engines combines with oxygen in the presence of sunlight to form ozone. The gas is present in fairly high amounts throughout the summer. It is also widespread. Ozone damage (bronzing) has been found wherever white beans are grown. The plants typically show symptoms in early August after full bloom. Injury first appears on the upper side of older leaves, but later the bronze or tiny rusty spots are present on the tops of all leaves. Ozone may cause premature leaf senescence and plant death.

Plants under stress and growing slowly are more sensitive than fast growing plants. Control of root rot will help reduce bronzing. Any practice which keeps the plants growing well in August will also keep bronzing injury to a minimum.

CROP ROTATION AND FERTILIZATION

Well-drained clay loam, or sandy loam soils with a high percentage of organic matter, are most suitable for white bean production. A rotation where beans are grown not more than once in three years is essential to avoid build-up of diseases. Soybeans, canola or sunflowers are not optimal rotational crops since they are susceptible to white mold (sclerotinia) and may increase the risk of white mold in succeeding bean crops. High yields are usually produced when beans follow a well-manured high-legume sod. Beans are particularly sensitive to certain herbicide residues, such as atrazine.

Beans do respond to soil structure as influenced by crop rotation. Studies at Centralia College of Agricultural Technology resulted in bean yields 1.8, 1.8 and 2.1 times higher following cereals, corn and alfalfa respectively, than following beans. This yield difference was attributed to greater disease problems and poorer soil structure associated with continuous bean cropping.

Soils high in fertility are necessary for optimum white bean production. Unlike many field crops, white beans do not often respond to direct application of fertilizers. A high fertility level should be maintained by application of adequate amounts of fertilizer to all crops in the rotation.

The bean seed is very susceptible to injury from fertilizer placed in contact with the seed. If fertilizer is to be applied at planting time, it should be placed 5 cm to the side and 5 cm below the seed. As an alternative, fertilizer may be ploughed down or worked in before planting.

Fertilizer needs should be determined by a soil test. If a soil test is not available, check the current edition of OMAF Publication 296, *Field Crop Recommendations,* for a fertilizer recommendation. White beans are legumes, and under optimal conditions will biologically fix a major portion of their nitrogen requirement if a satisfactory root system is maintained.

Where white bean yields have been low due to bronzing, low soil organic matter, poor soil structure, or root rots, broadcast and work up to 100 kg/ha nitrogen into the soil before planting.

SELECTION OF VARIETIES

Several public and private breeding programs in Ontario are actively developing new varieties adapted to the bean production areas All varieties of pedigreed white bean seed sold in Ontario have been thoroughly tested for their merit prior to official registration, and they have met or exceeded provincial standards for yield, disease-resistance, seed and cooking quality.

White bean producers should choose varieties that will mature on their farm in late August or early September, particularly in regions where periods of rainy weather are common in late September and October. Bean maturity can be determined by referring to heat unit rating and days to maturity as listed by variety in Publication 296, *Field Crop Recommendations.* The next most important criteria are yield potential and disease resistance. New growers should consult experienced local farmers, dealers or extension specialists to determine which diseases are most prevalent in their area.

SOIL PREPARATION AND PLANTING

White beans are very sensitive to soil compaction. Compacted soils restrict root growth, increase oxygen stress caused by excessive water, and increase the susceptibility of the plant to root rot. Compaction can be reduced by limiting secondary tillage trips to the minimum required to prepare a firm, level seedbed, and not working the soil when it is wet. Excessive secondary tillage of poorly structured soil may also lead to surface crusting after heavy rains.

Soil preparation may begin in mid-May to allow for some preplanting cultivation and the incorporation of certain herbicides. Because white beans are a sensitive crop, it is essential that the seed be placed in warm, mellow soil with sufficient moisture to ensure rapid, uniform emergence. Generally, a planting depth of 3.5 to 5.0 cm in warm, moist soil permits rapid emergence. (Some herbicides require a definite planting depth to ensure bean safety.)

The best date of planting varies with location. In areas of 2600 to 2900 heat units (e.g. Huron, Perth), white beans should be planted before June 10th. Research at Centralia College of Agricultural Technology indicates no yield difference if beans are planted between May 20th and June 10th. However, yields decline if beans are planted after June 10th. In areas of more than 2900 heat units (e.g. Kent, Lambton), planting should be done between June 10th and 20th.

Earlier planting dates permit the crops to mature at the time that good harvest weather is likely to prevail. At Brucefield (in Huron County), the probability of getting a given number of consecutive dry days is higher during the first 10 days of September than the remainder of the month. At Ridgetown (in Kent County), the chances of good harvest weather are similar for the entire month of September. Thus, in the Ridgetown area if planting is delayed, an early variety planted by June 25th should be ready for harvest by mid-September.

SEED TREATMENT

Only pedigreed seed, free from mechanical injury and weather damage, should be used. All seed should be tested for germination ability. Poor quality seed can result in stunted or bald-headed plants. Pedigreed seed provides assurance that the seed has met certain standards of purity, germination, freedom from disease and weeds.

Seed treatments are used to protect white beans from seed corn maggots, wireworms, and seed-decay organisms:

(a) diazinon is used for the control of seed corn maggots;
(b) lindane controls wireworms;
(c) a fungicide such as captan or thiram is used to protect the seed from decay-causing organisms.

Varieties not resistant to prevalent strains of anthracnose should be treated with a seed treatment containing thiophanate-methyl, such as DCT.

Drill-box formulations of insecticide-fungicide mixtures are available and should be used if the seed has not already been treated. Always follow instructions on the label when applying pesticides. The application of the insecticides alone may result in reduced germination. Seeds should not be treated with insecticides more than three months prior to planting. Bean crops following sod in a rotation are more likely to be attacked by seed corn maggot or wireworm than following cereal or corn crops. See OMAF Publication 296, *Field Crop Recommendations,* for currently recommended treatments.

SEEDING RATE AND ROW SPACING

A seeding rate of 40 to 45 kg/ha or 16 to 20 seeds per meter of row in 70 cm rows, is recommended. Seeding rates higher than 45 kg/ha have shown no yield advantage.

A row width of 60 to 70 cm has become standard because of the nature of equipment used. Row widths wider than 70 cm have consistently resulted in lower yields. Row widths less than 60 cm have shown a slight yield advantage, but cannot be pulled with conventional equipment and must be direct-combined. This results in some cutter bar loss, since the pods of the bean plants are close to the ground. More details can be obtained from the Factsheet, *Narrow-Row, Direct-Harvest White Bean Production* (available in Summer 1988).

WEEDS

Perennial weeds should be controlled prior to growing the white bean crop, since beans are sensitive to many of the herbicides commonly used to control these weeds. Weeds in the row may reduce yields by 350 to 450 kg/ha, even though cultivation is practiced. Heavy infestation of annual grasses have reduced yields as much as 50%. Recent studies have shown that weed competition prior to flowering has a greater impact on yield than do late-escaping weeds. Pulling and harvesting become difficult with heavy weed infestations. Delayed maturity, increased diseases, less than optimum drying conditions, increased percent pick, and more wear on machinery are additional drawbacks to weedy fields.

MECHANICAL WEED CONTROL

Working the seedbed before seeding reduces the weed problem. After the crop is seeded, rotary hoeing at speeds of 12 to 25 km/h can eliminate 70 to 80% of the annual weed seedings, provided they are just emerging and the soil is not too wet or too dry. Rotary hoeing may also improve the activity of pre-emergence herbicides and may reduce splash-up damage caused by heavy rains. Where the soil surface has crusted, bean emergence is improved by rotary hoeing. The stand of beans may be reduced with a rotary hoe treatment but usually a 10% loss can be tolerated at this time.

Caution: Do not use these implements when the beans are emerging or when the plants are wet. Rotary hoeing when the soil is loose and open may incorporate pre-emergence herbicides too deep and reduce weed control.

Overall mechanical weed control may be used several times before the beans are 10 to 15 cm high. After this stage of growth, inter-row cultivation can be effective. Do not cultivate when plants are wet from dew or rain because blight or fungal diseases may be transmitted from plant to plant. Adjust the cultivator to hill the row. This practice aids in the pulling operation and helps overcome root rot damage by initiating new roots further up the stem.

CHEMICAL WEED CONTROL FOR WHITE BEANS

Herbicides applied as a band treatment or as an overall application, are available for controlling annual weeds and nutsedge in white beans. Herbicides are also available for suppression of twitchgrass and field bindweed. Proper spraying techniques and a knowledge of the various herbicides is essential. It is often necessary to use a combination of herbicides as well as row cultivation for wide spectrum weed control. Cultivation is difficult in row widths less than 50 cm; however, the increased crop canopy provides added competition to weeds, as compared to that in wider rows. Up-to-date information on herbicide recommendations for white beans can be obtained from OMAF Publication 75, *Guide to Weed Control.*

HARVESTING

Beans are ready for harvest when the pods are dry and brittle and the beans are hard. When the beans "rattle" in most of the pods on the plant, the crop is ready to be pulled. The more mature the crop at time of pulling, the shorter the time required for drying on the ground. Keep the period between pulling and combining as short as possible to avoid the chance of weather damage. Exposure to rain lowers quality.

The most satisfactory method of harvest begins with a bean puller that cuts the plants 3-5 cm below the ground, and pushes the plants from two rows into one. Pullers can only be used in 60 cm or wider rows. For information on harvesting narrow-row white beans, refer to the Factsheet, *Narrow Row, Direct-Harvest White Bean Production* (available in Summer 1988). To prevent shattering losses, pull beans in the morning when the pods are damp and tough. A bean windrower is used to put four or more pulled rows together in a large windrow in order to improve combine efficiency. This operation also lifts the plants free of the soil, reducing the amount of dirt and stones that may enter the combine, and speeds up the drying process. Most beans are threshed by combines equipped with a pick-up attachment. Combines equipped with special options for the wide bean crop are available from most companies.

The adjustment of the combine is relation to the moisture content of the crop is more critical than the type of equipment used. Adjust the cylinder speed to suit the moisture content of the pods. When the crop is dry enough to combine, the cylinder speed should be just fast enough to open any tough pods. As the day progresses and the crop dries, the cylinder speed should be reduced to avoid damaging the beans. Concave clearance and the volume of the crop entering the machine are also important. Damage is more likely to occur with a low volume of material entering the combine. Throughout the threshing and handling operations, care must be taken to keep damage to a minimum. Cracked and broken beans can only be used for livestock feed.

White beans are consumed directly by humans. Therefore, wagons or trucks must be spotlessly clean before they are loaded. Glass bottles should never be used

Figure 1

Figure 2

Figure 3

Figure 1, 2 and 3, Pulling, windrowing and combining white beans.

around equipment or silos where beans are delivered. Broken glass in a wagon or truck load of beans may result in the entire shipment being refused at the elevator.

STORAGE

Storage is a very important aspect of the overall bean industry. Storage should only be done by qualified personnel.

Storage payments, negotiated by the Dealers' Association and the Ontario Bean Producers' Marketing Board, are paid to the dealer from November 1st until the crop has been sold or otherwise disposed of.

It is the dealer's responsibility, once he has received the beans from the producer, to make necessary deductions for pick and excess moisture in order to achieve a specified quality of beans. Pick includes beans that are large, immature, split, discolored, or diseased, as well as foreign materials such as stones and mud. Deductions are also made for beans that contain more than 18% moisture, to allow for shrinkage and the cost of drying.

Most beans are stored in the elevators although producers can be paid for storing the beans at home.

AGENCY MARKETING OF WHITE BEANS

Agency marketing was voted into existence by the producers in 1967 and took effect for the 1968 crop.

Agency marketing was developed to allow for more orderly marketing of the white bean crop. The dealer now has a handling charge, negotiated in advance by the Marketing Board and the Dealers' Association, on which to base his operations. As a result, the food processor can plan his operation on a more stable base.

Agency marketing is a pooling arrangement which allows a producer to deliver his beans to a dealer of his choice. The producer receives an initial payment from the dealer based on No. 1 beans, and the dealer is, in turn, reimbursed by the Board for that payment. All other payments are made directly to the producer by the Board when all the crop is sold and the pool terminated.

STABILIZATION

Over 95% of Ontario's white pea bean growers now participate in a National Tripartite Stabilization Plan. This plan assures growers of a guaranteed rate of return on their annual crop equal to the current year's cash cost of production plus 90% of the average margin (difference between market price and cash costs) for the preceeding seven years. This plan is completely voluntary, and producers must enroll and pay a premium.

OTHER REFERENCES

Publications

75 - *Guide to Weed Control*
296 - *Field Crop Recommendations*
1787 - *Growing Field Beans in Canada,* Agriculture Canada
1758 - *Bean Diseases and Their Control,* Agriculture Canada

Factsheets

Narrow-Row, Direct-Harvest White Bean Production (available in Summer 1988)
Coloured Beans in Ontario, Agdex 142/10
White Bean Insects, Agdex 142/622
Virus Diseases and Bronzing of Field and Snap Beans, Agdex 140/630
Common Blight of Field Beans, Agdex 142/632
Fungal Diseases of Field & Snap Beans, Agdex 255/630

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